Flight Challenge
Level I

OVERVIEW Participants study the principles of flight and design in order to fabricate and test fly gliders.

I. PURPOSE

A. Using materials provided, create a glider that stays in flight for the greatest elapsed time. Gliders must be designed to be launched from a catapult that is provided on site. The design process is described in a portfolio that is submitted for evaluation.

II. ELIGIBILITY

A. Entries are limited to two (2) per chapter.

III. SAFETY

A. Safety glasses are required for this event. TSA will not supply safety glasses. Students must be instructed by their teachers on the proper use of CA glue.

IV. TIME LIMITS

A. Participants have ninety (90) minutes to construct a glider. B. Participants are given a minimum of fifteen (15) minutes for trimming (test flights) of models.

V. ATTIRE

A. Casual TSA attire as described in Competitive Events Attire is the minimum requirement.

VI. PROCEDURE

A. Participants report to the event area at the time and place stated in the conference program with their metric sketches and notebooks.

B. Participants use their design sketches to fabricate a glider. Templates, jigs and fixtures also may be used.

C. Times for trimming (test flying) are scheduled for participants following the period required for glue drying.

D. Notebooks are evaluated.

E. Time trials are held to determine finalists. Participants have four (4) opportunities to fly their gliders for official times. The combined flight time of the best three (3) of the four (4) flights are

used to determine the ten (10) finalists.

F. Launch procedures

1. Participants are called by their group timer to the designated launch area.
2. The timers give participants a turn (or turns) to fly their gliders.
3. The glider is hooked to the rubber loop of the catapult provided by TSA, and the participant pulls the glider back to the wooden stop in front of the 350mm stop block on the catapult. The attitude and angle of the catapult (with the glider on it) are determined by participants as the glider is launched.
4. The participant releases the glider after getting the OK from the official timer.
5. Flight time begins when the glider is released and ends when the glider hits the floor or ground, or when it comes to rest on an obstruction.
6. No repairs are allowed after time trials begin.
7. Each participant has the times of four (4) trial flights recorded by the timer.
8. Ties are broken by determining the longest single flight time.

VII. REGULATIONS

A. Students are required to provide and wear safety glasses for this event.

B. Participants are not allowed to construct a glider without a completed sketch in their documentation notebooks.

C. The documentation notebook is a standard three (3)-ring binder that includes the following one-sided pages:

1. Cover sheet with event title, conference site, and conference date
2. Full-size sketch with dimensions
3. Pictures of two test planes constructed and flown by the participant; pictures should be labeled Plane 1 or Plane 2; pictures may be digital.
4. Flight log for each pictured test plane (see Flight Log sample below)

D. Sketch must:

1. show all parts that make up the glider
2. show metric dimensions
3. be drawn freehand
4. be drawn full scale
5. be drawn on paper no larger than 11" x 17"

Flight Log Sample

Plane #1 or Plane #2 (Circle one.)			Dates:	
Flight #	**Time Aloft**	**Flight Pattern**	**Trim Adjustment**	**Advisor Sign-Off**
#1				
#2				
#3				
#4				
#5				
#6				
#7				
#8				
#9				
#10				

E. Materials (SUPPLIED BY TSA - Only materials and tools provided on site by TSA may be used.)

1. Balsa wood for gliders with clay ballast used for balance
    a. fuselage blank, 3mm (1/8") thick x 13mm (½") wide x 300mm (11? ") long
    b. wing blank, 1.5mm (1/16") thick x 77mm (3") wide x 300mm (11? ") long
    c. stabilizer and fin blank, .75mm (3/32") thick x 51mm (2") wide x 150mm (5 7/8 ") long
    d. wooden shark's tooth hook, 3mm (? ") thick x 6.5mm (¼") wide x 20mm (¾") long, glued to the bottom of the fuselage, flush with nose of glider
2. glue [cyanoacrylate (CA) only, medium viscosity, gap filling]
3. glue solvent
4. accelerator (for glue drying)
5. 5. a maximum of five (5) grams of clay, to be used for balance

F. Tools (SUPPLIED BY TSA - Only materials and tools provided on site by TSA may be used.)

1. X-acto knife with #11 blade
2. pencils
3. cutting board
4. straight pins

5. rulers
6. sandpaper (students may bring their own sandpaper, as stated in regulation I.3)

G. Minimum tolerances
   1. Fuselage: 298mm to 300mm long
   2. 2. Shark's hook: 18mm to 20mm long x 6mm wide

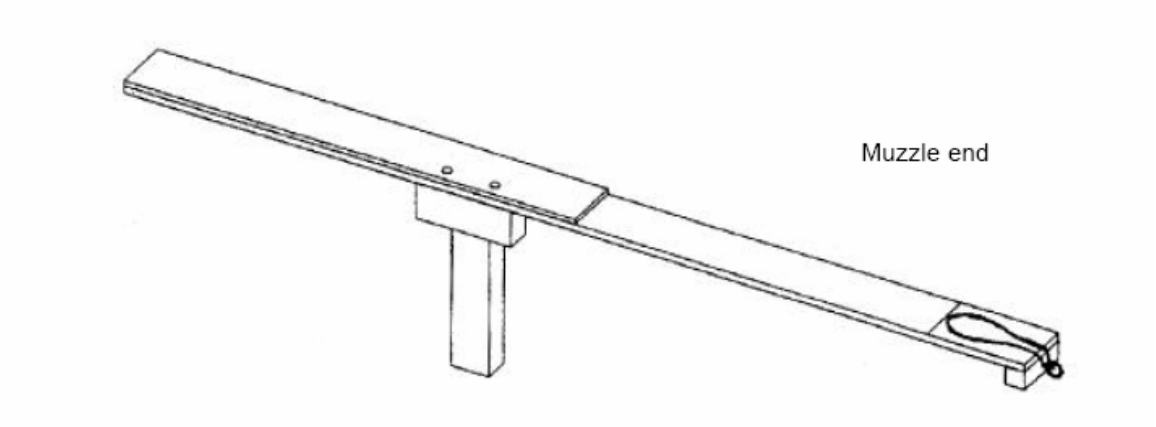
H. Catapult specifications (to be used for trim and experimentation at home school and during preparation prior to time trial flights):
   1. Catapults for timed flights are supplied by TSA at the national event site.
   2. Catapults are made from hardwood or plywood.
   3. Catapult wooden stick dimensions: laminate a piece of wood (10mm thick x 45mm wide x 700mm long) to a second piece of wood (6mm thick x 45mm wide x 350mm long), aligning the pieces at the handle end and gluing them face-to-face (see drawing).
   4. The handle is 20mm thick x 30mm wide x 150mm long and is attached by screws to a 15mm thick x 30mm wide x 75mm long block using a middle-lap joint. The 75mm long block then is screwed to the laminated main catapult stick beginning at 400mm from the muzzle end.
   5. The rubber loop is 1.5mm thick x 1.5mm wide x 75mm long when attached (relaxed) to a screw eye and the knotted end secured to the screw eye with a 7mm opening. The rubber loop material is Federation Aeronautical International (FAI) competition rubber, available from companies specializing in flying scale model kits.
   6. The screw eye is attached to the center of the 15mm thick x 15mm wide x 45mm long wooden block connected to the underside of the muzzle end of the catapult.

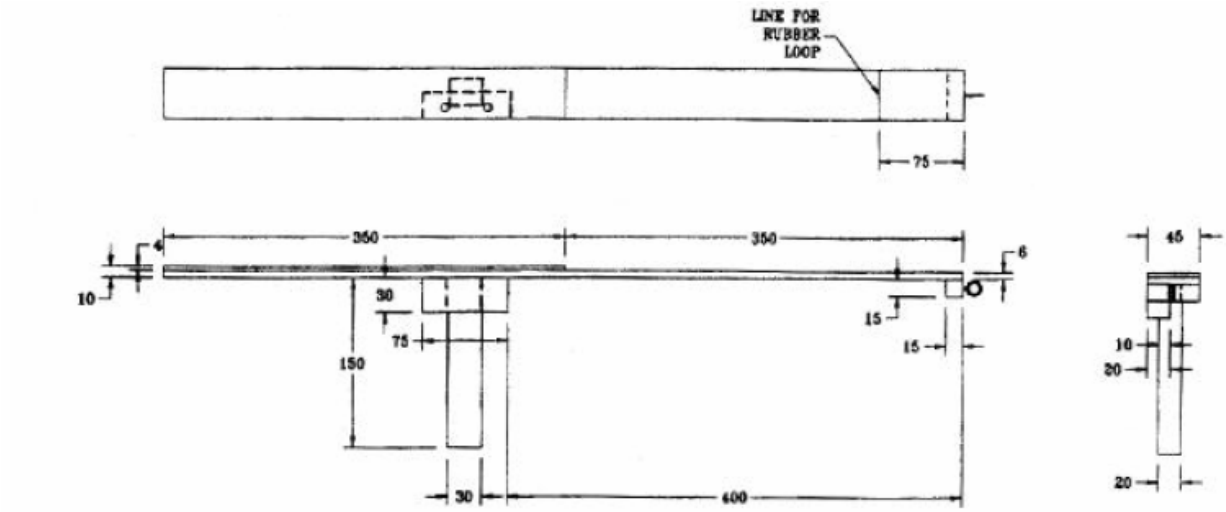
I. Templates, jigs, and fixtures that MAY be used in constructing gliders:
   1. Templates, jigs, and fixtures must be developed and built by students.
   2. Storage container—All student-made items must fit in a box not exceeding 150mm high x 250mm wide x 350mm long.
   3. Sanding blocks—May have two grits affixed to top and bottom; grits are chosen by the student.
   4. Traction plate—440-grit sandpaper (150mm x 300mm maximum) attached to a piece of thin plywood.
   5. Dihedral fixture—An all-wood apparatus that assists in sanding the critical dihedral joints and that secures the model as the glue dries to ensure a precise prototype.

EVALUATION

Evaluation is based on points earned for the quality of the documentation notebook and the accumulated flying time of three (3) trials.

CATAPULT DRAWING





VIII. CRITERIA FOR JUDGING

A. Flight Duration..... Top three flight times

B. Flight Rank.....Ranking with other flights

C. Documentation Notebook Factor.....1.01 low, 1.20 high

D. Rules Violation..... Divide total by 1.20